

(1390 REV. 5-93) US DEPT. OF COMMERCE PATENT & TRADEMARK OFFICE  <b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>		ATTORNEY'S DOCKET NUMBER 102083
		U.S. APPLICATION NO. (if known, sec 37 C.F.R.1.5)  <b>09/180892</b>
INTERNATIONAL APPLICATION NO. PCT/FR98/0652	INTERNATIONAL FILING DATE 31 March 1998	PRIORITY DATE CLAIMED 1 April 1997
TITLE OF INVENTION PROCESS AND DEVICE FOR SUSPENDING HEAVY PARTICLES OF A SOLID IN A LIQUID		
APPLICANT(S) FOR DO/EO/US Bruno COLIN		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.		
2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.		
3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).		
4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.		
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ul style="list-style-type: none"> <li>a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</li> </ul>		
6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).		
7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ul style="list-style-type: none"> <li>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input type="checkbox"/> have been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ul>		
8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).		
9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).		
10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).		
<b>Items 11. to 16. below concern other document(s) or information included:</b>		
11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.		
12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.		
13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.		
14. <input type="checkbox"/> A substitute specification.		
15. <input type="checkbox"/> A small entity statement.		
16. <input type="checkbox"/> Other items or information:		

DEPOSIT ACCOUNT USE  
 AUTHORIZATION  
 Please grant any extension  
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 Charge any fee due to our  
 Deposit Account No. 15-0461

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO. PCT/FR98/00652	ATTORNEY'S DOCKET NUMBER 102083
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17. <input checked="" type="checkbox"/> The following fees are submitted:  <b>Basic National fee (37 CFR 1.492(a)(1)-(5)):</b>  Search Report has been prepared by the EPO or JPO.....\$930.00  International preliminary examination fee paid to USPTO (37 CFR 1.482).....\$670.00  No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$760.00  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$970.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....\$ 96.00  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>	CALCULATIONS	PTO USE ONLY																								
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Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	\$																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">Claims</th> <th style="width: 20%;">Number Filed</th> <th style="width: 10%;">Number Extra</th> <th style="width: 10%;">Rate</th> <th style="width: 10%;"></th> <th style="width: 10%;"></th> </tr> <tr> <td>Total Claims</td> <td>9- 20 =</td> <td>0</td> <td>X \$ 18.00</td> <td>\$</td> <td></td> </tr> <tr> <td>Independent Claims</td> <td>2- 3 =</td> <td>0</td> <td>X \$ 78.00</td> <td>\$</td> <td></td> </tr> <tr> <td colspan="3">Multiple dependent claim(s)(if applicable)</td> <td>+ \$260.00</td> <td>\$</td> <td></td> </tr> </table>	Claims	Number Filed	Number Extra	Rate			Total Claims	9- 20 =	0	X \$ 18.00	\$		Independent Claims	2- 3 =	0	X \$ 78.00	\$		Multiple dependent claim(s)(if applicable)			+ \$260.00	\$			
Claims	Number Filed	Number Extra	Rate																							
Total Claims	9- 20 =	0	X \$ 18.00	\$																						
Independent Claims	2- 3 =	0	X \$ 78.00	\$																						
Multiple dependent claim(s)(if applicable)			+ \$260.00	\$																						
<b>TOTAL OF ABOVE CALCULATIONS =</b>	\$930.00																									
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).	\$																									
<b>SUBTOTAL =</b>	\$930.00																									
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 month from the earliest claimed priority date (37 CFR 1.492(f)).	\$																									
<b>TOTAL NATIONAL FEE =</b>	\$930.00																									
	Amount to be refunded	\$																								
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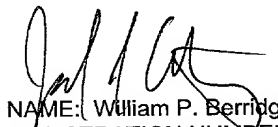
a. ☒ Check No. 62148 in the amount of \$930.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 15-0461. A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:  
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 NAME: William P. Berridge  
 REGISTRATION NUMBER: 30,024  
  
 NAME: Joel S. Armstrong  
 REGISTRATION NUMBER: 36,430

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Bruno COLIN

Application No.: U.S. National Stage of PCT/FR98/00652

Filed: November 16, 1998

Docket No.: 102083

For: PROCESS AND DEVICE FOR SUSPENDING HEAVY PARTICLES OF A SOLID IN A LIQUID

SUPPLEMENTAL PRELIMINARY AMENDMENT

Assistant Commissioner of Patents  
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE ABSTRACT:

Please include the enclosed Abstract page into the instant application as an Abstract was not included with the originally filed application.

IN THE DRAWINGS:

Attached hereto is a Request for Approval of Drawing Correction, along with a copy of amended drawing Fig. 1.

IN THE SPECIFICATION:

Please amend the specification as follows:

Page 1, line 3, insert --BACKGROUND OF THE INVENTION--.

Page 2, between lines 2 and 3 insert --SUMMARY OF THE INVENTION--;

lines 21-24, change "The present invention is now described with reference to the appended single figure which schematically represents a vertical section of a device according to the invention." to --BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in conjunction with the following drawings wherein:

Fig. 1 is a vertical sectional view of the device according to the invention;

Fig. 2 is a graph depicting the results of a first experiment using the device shown in Fig. 1;

Fig. 3 is a graph depicting the results of a second experiment using the device shown in Fig. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT--;

line 25, change "A" to --As shown in Fig. 1, the--.

Page 7, line 2, Change "CLAIMS" to --WHAT IS CLAIMED IS:--.

IN THE CLAIMS:

Please amend claims 1-9 as follows:

1. (Amended) A method [Process] for suspending particles [(1)] of a solid in a predetermined volume [(2)] of liquid contained inside a container [(3)], the method comprising the following steps:  
  
immersing the solid in the predetermined volume of liquid such that the particles of the solid are deposited on a flat bottom of the container as sediment[starting with a deposit (4) which is made up of the said particles sedimented on the bottom (3a) of the said container and is immersed in the said volume of liquid, characterized in that];  
  
establishing a gas circuit [(5) is set up] in the container[, partly in direct] in partial contact with the predetermined volume of liquid [(2)], the gas circuit forming [in] a loop comprising at least two substantially parallel flows [(5a, 5b) which are] separated by a head loss [(6)] located level with the flat bottom [(3a)] of the container [(3),]; and  
  
alternating a direction of a gas stream traveling [travelling] through the [said] container along the [said] gas circuit [(5) is alternated].

2. (Amended) The method [Process] according to Claim 1, wherein [characterized in that] the gas circuit does one of enter and exit [(5) enters or leaves] the container through two openings formed in the device [(7, 8)] for inlet or outlet of the two parallel flows [(5a, 5b)] respectively, the two openings being [formed in the said container (3) and] isolated from one another, and the method comprises the additional step of alternating a pressure applied to the gas circuit between one of a positive pressure and [then] a negative pressure [is applied] alternately through at least one of the two openings [said opening (7, 8)].

3. (Amended) The method [Process] according to Claim 1, wherein [characterized in that] inert solid beads [(9)] are dispersed freely at the flat bottom [(3a)] of the container.

4. (Amended) The method [Process] according to Claim 1, wherein [characterized in that the] the head loss is [(6) represents] at least 10 mbar[, and is preferably between 10 mbar and 500 mbar, and for example between 50 mbar and 200 mbar].

5. (Amended) The method [Process] according to Claim 1, wherein [characterized in that] the gas stream is alternated at a frequency at least equal to 3 Hz[, and preferably between 4 and 25 Hz, for example between 5 and 10 Hz].

6. (Amended) A device [Device comprising a container (3)] for holding a predetermined volume of liquid and [particles (1) of a solid, which is] designed for suspending [the said] particles in the liquid, the device comprising:

a container providing a tapered neck and a flat bottom, the container holding a predetermined volume of the liquid [starting with a deposit (4) which is made up of the said particles sedimented on the bottom (3a) of the said container and is immersed in the said volume of liquid, characterized in that it comprises];

at least one conduit [(10) which is arranged] disposed in the [said] container, the conduit having a first end extending out of the tapered neck and a second end terminating at the flat bottom, the conduit [(3) and] defines [in the latter] two chambers [(11, 12) which

communicate] communicating with [one another] each other through a first passage [(6)]  
formed level with the flat bottom [(3a)] of the [said] container [(3),] and with the atmosphere  
outside of the container [respectively] by at least two openings [(7, 8) at least,]; and

[a] means of alternate pressurization for alternating a pressure in a gas circuit flowing  
through the device using the two chambers, the pressure alternating between one of a positive  
pressure and a negative pressure, the alternate pressurization means communicating [which  
communicates] with at least one of the two openings[said opening (7, 8) and is designed to  
set up a positive pressure then a negative pressure successively in the gas circuit (5)  
comprising the two chambers (11, 12) which communicate with one another].

7. (Twice Amended) The device [Device] according to Claim 6, wherein  
[characterized in that] the conduit [(10)] is [in the form of] a tube and the first passage formed  
level with the flat bottom is at least one gap [which enters the container (3) as far as a lower  
level, forming at least one gap (6) with] between the flat bottom [(3a)] of the [said] container  
and the second end.

8. (Twice Amended) The device [Device] according to Claim 6, wherein  
[characterized in that the container (3) has a] a first opening between the neck [(3b) in which]  
and the [upper] first end of the conduit [(10) is arranged, with a functional gap defining an]  
defines one of the two openings communicating with one of [opening (7) to one (11) of] the  
two chambers.

9. (Amended) The device [Device] according to Claim 8, further comprising  
[characterized in that the upper end of the conduit is closed off by] a stopper partially closing  
the first end of the conduit, the stopper [(13) in which] having a second passage [(13a)]  
defining [an opening (8) to] the other of the two openings in communication with [(12) of]  
the other of the two chambers [is formed].

Please add claims 10-12 as follows:

--10. The method according to claim 4, wherein the head loss is less than 500mbar.--

--11. The method according to Claim 1, wherein the gas stream is alternated at a frequency between 4 and 25 Hz.--

--12. The device according to claim 6, further comprising a plurality of inert solid beads freely dispersed at the flat bottom of the container.--

REMARKS

Claims 1-12 are pending. By this Amendment, the specification and claims 1-9 are amended to conform to U.S. Patent Practice and claims 10-12 are added. No new matter is presented.

Attached hereto is an Abstract page to be inserted into the instant application as an Abstract page was not included in the originally filed application.

Attached hereto is a Request for Approval of Drawing Corrections, along with a copy of corrected drawing Fig. 1 wherein the drawing is provided with a --Fig. 1-- legend to identify the drawing.

Prompt and favorable examination is respectfully requested.

Respectfully submitted,



William P. Berridge  
Registration No. 30,024

WPB:MO/mdo

Murat Ozgu  
Registration No. P-44,275

Attachments:

Abstract  
Request for Approval of Drawing Corrections

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## ABSTRACT OF THE DISCLOSURE

A device and method for holding a predetermined volume of liquid having suspended particles. The device includes a container for holding the predetermined volume of liquid, the container having a tapered neck and a flat bottom. At least one conduit having a first end extending out a the tapered neck and the second end terminating at the flat bottom is disposed in the container. The conduit defining two chambers communicating with each other through a first passage formed at the bottom of the container and communicating with the atmosphere outside of the container by at least two openings. A pressure in a gas circuit flowing through the device is alternated between a positive pressure and a negative pressure using the two chambers.



Process and device for suspending heavy particles of a  
solid in a liquid

The present invention relates to the suspending  
5 of particles of a solid in a predetermined volume of  
liquid. More particularly, the invention deals with the  
suspending, or re-suspending, of particles when they  
are contained in a container, with a predetermined  
volume of liquid, the particles being partially  
10 collected in the form of a deposit or sediment immersed  
by the liquid at the bottom of the container.

The particles/liquid physical state previously  
described and defined is encountered in particular in  
certain analysis protocols or processes, especially  
15 biological ones, involving relatively heavy particles,  
for example each consisting of a magnetic substrate to  
which, for example, a reagent or an analyte is bound.  
In order to implement or continue the analysis process,  
it is essential to suspend or re-suspend the particles  
20 in the predetermined volume of liquid inside the  
container, since failing this the particles which have  
sedimented are removed from the analysis process and  
vitiate its result in terms of reliability, sensitivity  
and reproducibility.

25 Until now, these particles have been suspended  
by mechanical or fluidic means, for example by passing  
a gas stream through the liquid volume in the  
container, close to or in contact with the deposit of  
sedimented particles. An operation of this type  
30 generally leads to the formation of foam, at the level  
of the interface between the liquid volume and the  
atmosphere internal to the container; it therefore has  
to be controlled carefully in order to limit, and if  
possible eliminate, the formation of foam which, in  
35 particular, hampers any subsequent optical measurement  
taken through the container. In all, this suspending or  
re-suspending of particles starting from a deposit at  
the bottom of a container, with everything in a

predetermined volume of liquid, represents an intricate and relatively time-consuming operation.

The present invention therefore relates to a suspending process which is relatively "gentle" while remaining efficient, in so far as it does not significantly disturb the interface between the predetermined volume of liquid and the gas atmosphere contained in the container, for example an analysis cuvette.

According to the present invention, it has unexpectedly been discovered that the desired result can be obtained by setting up a gas circuit in the container, partly in direct contact with the liquid, in a loop comprising at least two substantially parallel flows which are separated by a head loss located level with the bottom of the container, and alternating a gas stream travelling through the said container along the said gas circuit.

Preferably, inert solid beads are arranged freely at the bottom of the container.

The present invention is now described with reference to the appended single figure which schematically represents a vertical section of a device according to the invention.

A device according to the invention generally comprises:

- a container 3 for holding a predetermined volume 2 of liquid, and particles 1 of a solid which are normally dispersed inside the container, in the volume of liquid, for example an aqueous phase; this container 3 has a flat bottom 3a and a neck 3b

- at least one conduit 10 which is arranged and penetrates inside the container 3, one end of which emerges from the neck 3b, forming a tubular gap with the latter, and the perforated other end 6 of which is located level with and against the bottom 3a of the container, thus forming, as described below, a head loss localized between the lower periphery of the conduit 3 and the bottom 3a opposite

- a stopper 13 which closes off the upper end of the conduit 10 and in which an axial passage 13a is formed

5 - and solid inert beads 9 arranged freely on the bottom 3a of the container.

If necessary, the conduit 10/stopper 13 combination forms a component which is independent of the container 3 and can be introduced and extracted from the container 3, in order to suspend or re-suspend  
10 the particles 1 which will be discussed below.

The result of the structure or arrangement described above is that, in relation with the container 3, the conduit 10 defines two chambers 11 and 12, one which is external with respect to the conduit 10 and  
15 another which is internal to the conduit 10, communicating with one another through at least one gap or passage 6 which has been described above, level with the bottom 3a of the container 3, and which generates during operation the head loss which will be discussed  
20 below. These two chambers 11 and 12 communicate with the outside, respectively through the tubular gap 3, level with the neck 3b, and the opening 8 consisting of the axial channel 13a in the stopper 13. In this way, a gas circuit shown by the dot and dash line 5 can be set  
25 up in the container 3, passing through the opening 7, the chamber 11, the passage 6, the chamber 12 and the opening 8, or the reverse.

A means 14 of alternate pressurization is applied to the stopper 13, in relation with the opening  
30 8, and makes it possible to set up a positive pressure then a negative pressure successively in the gas circuit 5 described above.

Irrespective of the relevant direction of the gas stream, the means 14 of alternate pressurization  
35 makes it possible for the circuit 5 shown by a dot and dash line in the single figure to be set up in the container 3, partly in direct contact with the liquid 2, in a loop or hair pin, comprising two substantially parallel flows 5a and 5b which circulate in the

chambers 11 and 12 respectively and are separated by the head loss 6 located level with the bottom 3a of the container 3. Further, operation of the means 14 makes it possible to alternate the gas stream passing through the container 3 in the circuit 5 described above.

The gas circuit thus set up enters or leaves the container 3 through the two openings 7 and 8, each for inlet or outlet of the two flows 5a and 5b respectively, which are formed in the container 3 and are isolated from one another. During operation, the means 14 alternately applies a positive pressure then a negative pressure through the opening 8.

The following operating conditions or parameters may be considered:

- the head loss represents at least 10 mbar, and is preferably between 10 mbar and 500 mbar, and is for example between 50 mbar and 200 mbar
- the gas stream is alternated at a frequency at least equal to 3 Hz, and is preferably between 4 Hz and 25 Hz, for example between 5 Hz and 10 Hz.

**Example 1: Effect of the alternation frequency of the gas flow**

Etapor M1 070/60 particles coated with alkaline phosphatase and diluted in an estradiol buffer (Tris NaCl Prionex 5g/l) are re-suspended after one night of sedimentation at room temperature (concentration of the particles: 100µg/ml). The frequencies applied are respectively 2.5 Hz and 11 Hz. The percentage re-suspended was obtained by negative weighing according to the document FR-A-2 710 410 using a Mettler AE 240 magnetic balance modified to the requirements of the experiment. The error connected with the accuracy of the measurement is + or - 2%.

The results are presented in table 1 below and in the appended graph, according to Figure 2, in which:

- the ordinate represents the percentage re-suspended

- the abscissa represents the treatment time, expressed in seconds

- the black squares are assigned to the results obtained with a frequency of 2.5 Hz, and the white squares to the results obtained with a frequency of 11 Hz.

**Table 1**

Re-suspension time in seconds.	Percentage re-suspended at a frequency of 2.5 Hz.	Percentage re-suspended at a frequency of 11 Hz.
0	34.8	39
2	47.9	83.3
4	65.3	98.9
6	73.6	100*
8	85.5	100*
10	84.5	100*

\* indicates an error of + or - 2%.

As shown by the above table and the appended graph according to figure 2 for a frequency of 11 Hz, the frequency plays an important role in the process of the invention. 100% re-suspension is obtained after an agitation time of at least 6 seconds at a frequency of 11 Hz, while it is impossible to obtain a homogeneous suspension, even after 10 seconds of agitation, at a frequency of 2.5 Hz.

**Example 2: Effect of the beads on the re-suspension**

Seradyn C942339 particles coated with alkaline phosphatase and diluted in an estradiol buffer (Tris NaCl Prionex 5g/l) were re-suspended after one month of sedimentation at a temperature of between 2 and 8°C (concentration of the particles: 100µ/ml). The frequency applied is 11 Hz. The percentage re-suspended was obtained by negative weighing according to patent FR-A-2 710 410 using a Mettler AE 240 magnetic balance modified to the requirements of the experiment. The

error connected with the accuracy of the measurement is + or - 2%.

The results are presented in Table 2 below and in the appended graph according to Figure 3, in which:

- 5        - the abscissa and ordinate express the same quantities and scales as those represented in Fig. 2
- the black squares are assigned to the results without beads, and the white squares to the results with 5 mm glass beads.

10

**Table 2**

Re-suspension time in seconds.	Percentage re-suspended without any beads.	Percentage re-suspended with 5mm glass beads.
0	0	0
2	81	100*
4	93	100*
6	100*	100*
8	100*	100*
10	100*	100*

\* indicates an error of + or - 2%.

- 15        As shown by the above table and the appended graph according to Fig. 3, the addition of glass beads plays an essential role in the process of the invention. 100% re-suspension is obtained after an agitation time of at least 2 seconds at a frequency of
- 20        11 Hz in the presence of glass beads, while in the absence of glass beads it is possible to obtain a homogeneous suspension only after 6 seconds of agitation.

CLAIMS

1. Process for suspending particles (1) of a solid  
5 in a predetermined volume (2) of liquid contained  
inside a container (3), starting with a deposit (4)  
which is made up of the said particles sedimented on  
the bottom (3a) of the said container and is immersed  
in the said volume of liquid, characterized in that a  
10 gas circuit (5) is set up in the container, partly in  
direct contact with the liquid (2), in a loop  
comprising at least two substantially parallel flows  
(5a, 5b) which are separated by a head loss (6) located  
level with the bottom (3a) of the container (3), and a  
15 gas stream travelling through the said container along  
the said gas circuit (5) is alternated.
2. Process according to Claim 1, characterized in  
that the gas circuit (5) enters or leaves the container  
through two openings (7, 8) for inlet or outlet of the  
20 two flows (5a, 5b) respectively, the openings being  
formed in the said container (3) and isolated from one  
another, and a positive pressure then a negative  
pressure is applied alternately through at least one  
said opening (7, 8).
- 25 3. Process according to Claim 1, characterized in  
that inert solid beads (9) are dispersed freely at the  
bottom (3a) of the container.
4. Process according to Claim 1, characterized in  
that the head loss (6) represents at least 10 mbar, and  
30 is preferably between 10 mbar and 500 mbar, and for  
example between 50 mbar and 200 mbar.
5. Process according to Claim 1, characterized in  
that the gas stream is alternated at a frequency at  
least equal to 3 Hz, and preferably between 4 and  
35 25 Hz, for example between 5 and 10 Hz.
6. Device comprising a container (3) for holding a  
predetermined volume of liquid and particles (1) of a  
solid, which is designed for suspending the said  
particles starting with a deposit (4) which is made up

of the said particles sedimented on the bottom (3a) of the said container and is immersed in the said volume of liquid, characterized in that it comprises at least one conduit (10) which is arranged in the said container (3) and defines in the latter two chambers (11, 12) which communicate with one another through a passage (6) formed level with the bottom (3a) of the said container (3), and with the outside respectively by two openings (7, 8) at least, and a means of alternate pressurization which communicates with at least one said opening (7, 8) and is designed to set up a positive pressure then a negative pressure successively in the gas circuit (5) comprising the two chambers (11, 12) which communicate with one another.

15 7. Device according to Claim 1, characterized in that the conduit (10) is in the form of a tube which enters the container (3) as far as a lower level, forming at least one gap (6) with the bottom (3a) of the said container.

20 8. Device according to Claim 8, characterized in that the container (3) has a neck (3b) in which the upper end of the conduit (10) is arranged, with a functional gap defining an opening (7) to one (11) of the two chambers.

25 9. Device according to Claim 8, characterized in that the upper end of the conduit is closed off by a stopper (13) in which a passage (13a) defining an opening (8) to the other (12) of the two chambers is formed.



**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Bruno COLIN

Application No.: U.S. National Stage of PCT/FR98/00652

Filed: November 16, 1998

Docket No.: 102083

For: PROCESS AND DEVICE FOR SUSPENDING HEAVY PARTICLES OF A SOLID  
IN A LIQUID

**REQUEST FOR APPROVAL OF DRAWING CORRECTIONS**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

The Examiner is requested to review and approve the proposed corrections to Figure 1, marked in red on the attached copy of such drawing figure. The drawing figure is labeled with a --Fig. 1-- legend to identify the drawing.

Upon approval by the Examiner, and upon allowance of this application, the formal drawings will be corrected.

Respectfully submitted,



William P. Berridge  
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Murat Ozgu  
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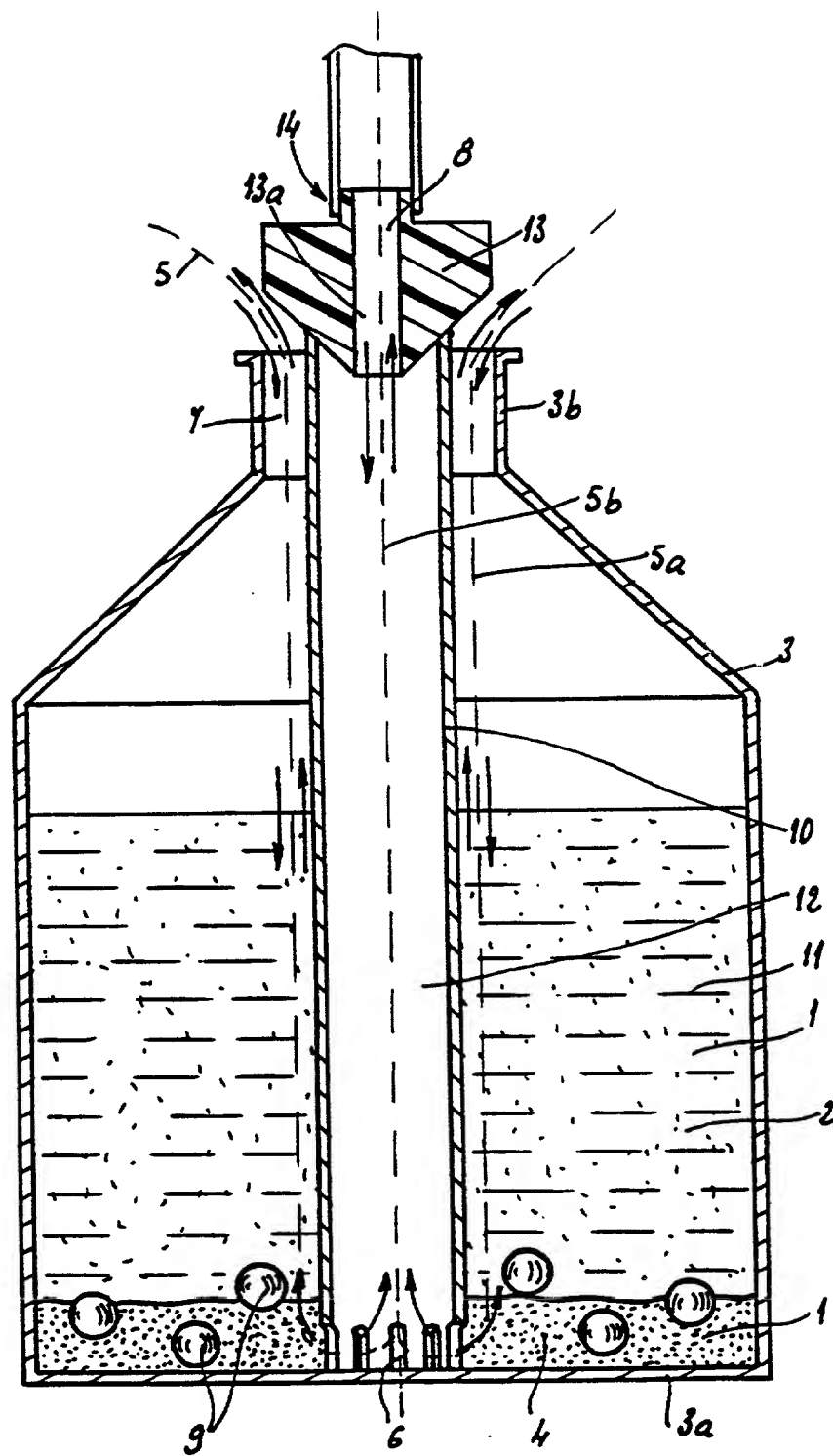
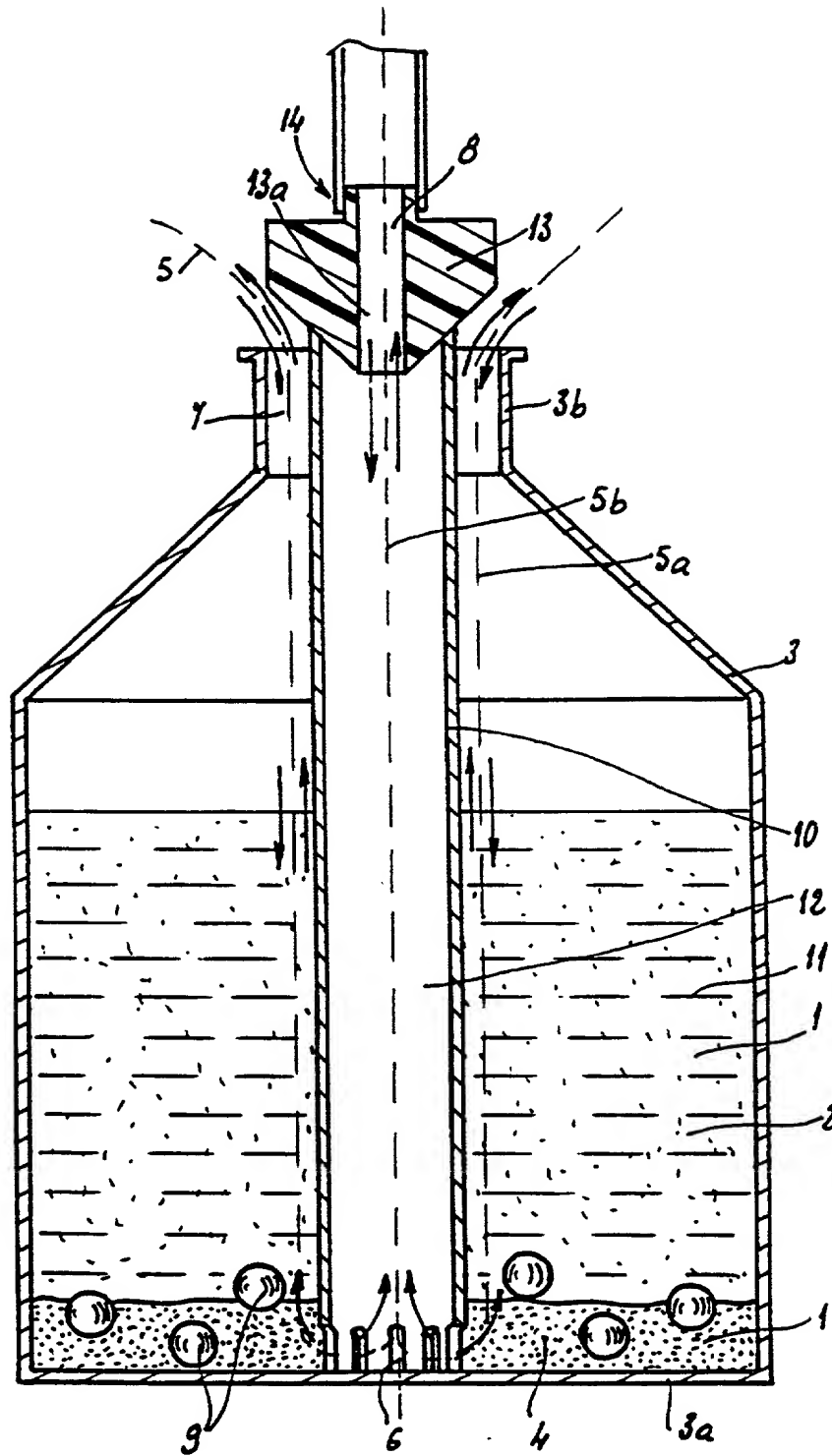
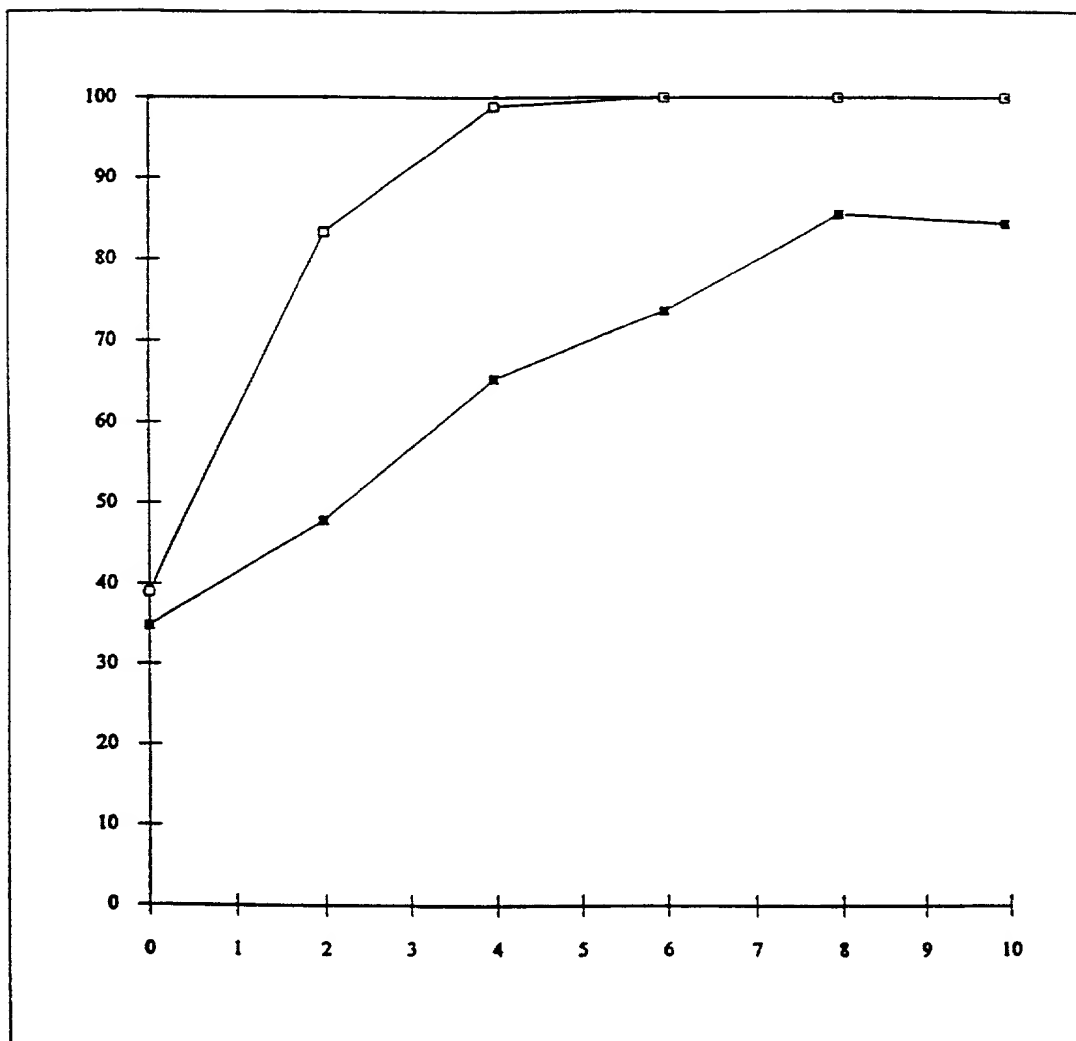


Fig. 1



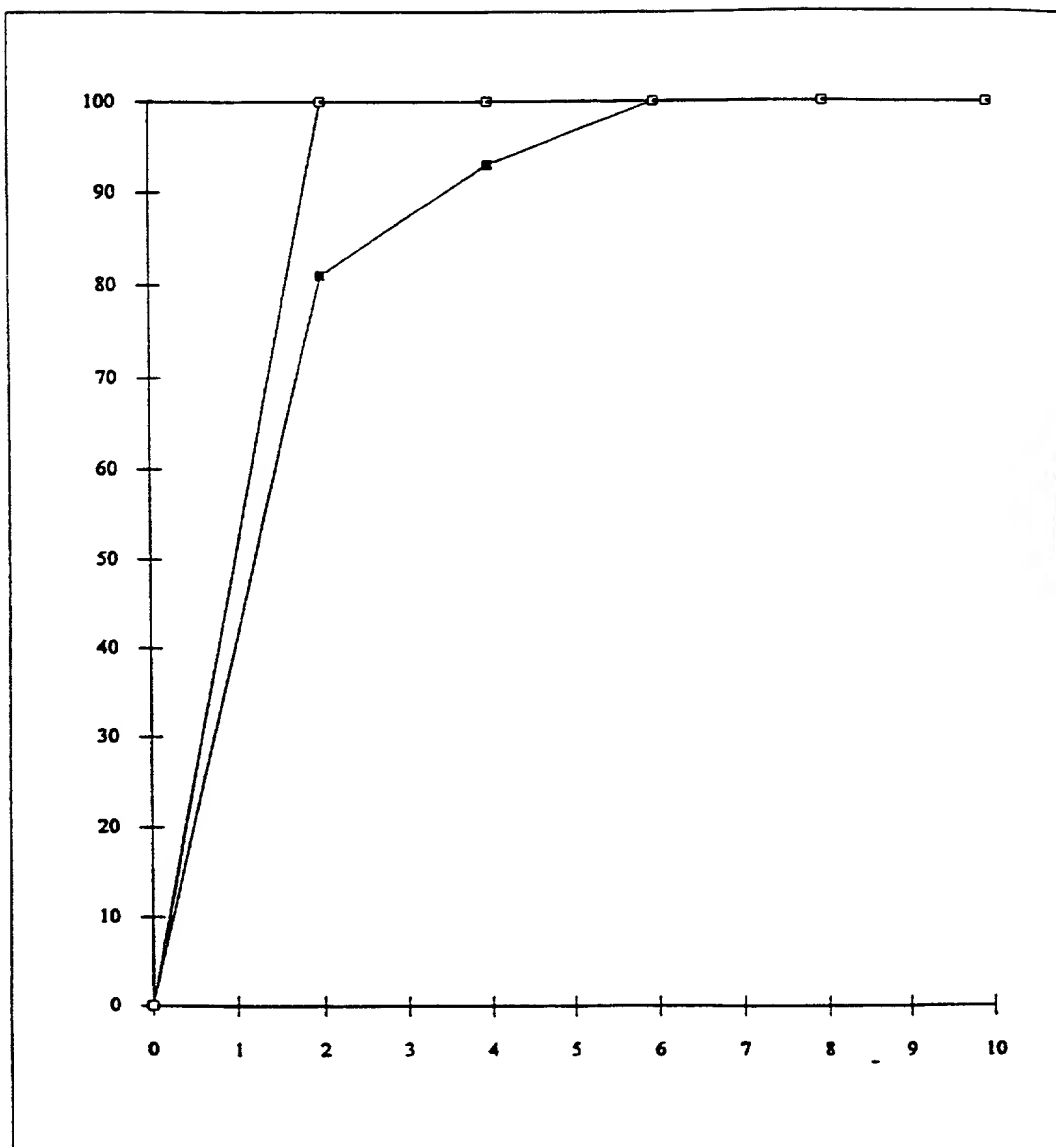
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FIG 2



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FIG 3



**DECLARATION AND POWER OF ATTORNEY  
UNDER 35 USC §371(c)(4) FOR  
PCT APPLICATION FOR UNITED STATES PATENT**

As a below named inventor, I hereby declare that:  
my residence, post office address and citizenship are as stated below under my name;

I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought, namely the invention entitled: Process and apparatus for suspending heavy particles of a solid in a liquid

described and claimed in international application number PCT/FR98/00652  
filed March 31, 1998.

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56. Under Title 35, U.S. Code §119, the priority benefits of the following foreign application(s) filed within one year prior to my international application are hereby claimed:

French Patent Application No 97 04238  
filed 1st April 1997

The following application(s) for patent or inventor's certificate on this invention were filed in countries foreign to the United States of America either (a) more than one year prior to my international application, or (b) before the filing date of the above-named foreign priority application(s):

I hereby appoint the following as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent Office:

⑤ James A. Oliff, Reg. No. 27,075; William P. Berridge, Reg. No. 30,024;  
Kirk M. Hudson, Reg. No. 27,562; Thomas J. Pardini, Reg. No. 30,411; and  
Edward P. Walker, Reg. No. 31,450.

**ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO OLIFF & BERRIDGE, P.O. BOX 19928, ALEXANDRIA, VIRGINIA 22320, TELEPHONE (703) 836-6400.**

I hereby declare that I have reviewed and understand the contents of this Declaration, and that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00

1	Typewritten Full Name of Sole or First Inventor	<u>Bruno</u>	<u>COLIN</u>
		Given Name	Middle Initial
2	Inventor's Signature	<u>Bruno</u>	<u>COLIN</u>
3	Date of Signature	<u>14 October 1998</u>	
	Residence	<u>Marcy l'Etoile</u>	<u>FRANCE</u>
	City	<u>FRY</u>	State or Province
	Citizenship	<u>French</u>	Country
	Post Office Address	<u>23 Chemin des Garennes</u>	
	(Insert complete mailing address, including country)	<u>69280 MARCY L'ETOILE, FRANCE</u>	

Note to Inventor: Please sign name on line 2 exactly as it appears in line 1 and insert the actual date of signing on line 3.

IF THERE IS MORE THAN ONE INVENTOR USE PAGE 2 AND PLACE AN "X" HERE ☐